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"Studies on Characterization and Comparison of Fatty Acid Composition In Skeletal Muscle From Diverse Animal Species of Nanded District"

Research Proposal Submitted
In Partial Fulfilment of Registration to Ph.D. Programme
in the Subject of Zoology Faculty of Science and Technology

Submitted by

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Adarsh Education Society's
Arts, Commerce and Science College, Hingoli

2023

The nutrients that are easiest for the human body to assimilate. Vitamin B3 is found in higher concentrations in muscle, whereas vitamin B12 is abundant in oxidative muscle. Carnosine is a bioactive of □-alanine and histidine found in animal sources, where it is highly concentrated in muscle.

Composition of fatty acid: The fatty acids in meat are mainly of medium to long chain length, that is, they have 12- to 22-carbon atoms in the molecule, with a basic structure of CH_3-(CH_2)n-COOH. The fatty acids in meat are found in two main lipid classes, neutral triacylglycerol (storage role) and more polar glycerophospholipid (structural and metabolic role). The fomer is the main lipid component (> 90%) of adipose ttissue in mature animals (visible fat) and the latter, a constituent of cell memberanes, contributes between 10% and 40% of the total fatty acids in muscle. Saturated Fatty acids found in muscles are namely Propionic (C3) Butyric (C4) Valeric (C5) Caproic (C6) Enanthic (C7) Caprylic (C8) Pelargonic (C9) Capric (C10) Undecyclic (C11) Lauric (C12) Tridecylic (C13) Myristic (C14) Pentadecylic (C15) Palmitic (C16) Margaric (C17) Stearic (C18) Nonadecylic (C19) Arachidic (C20)Heneicosylic (C21) Behenic (C22) Tricosylic (C23) Lignoceric (C24) Pentacosylic (C25) Cerotic (C26) Carboceric (C27)Montanic (C28) Nonatriacontanoic (C29) Melissic (C30)Hentriacontylic (C31) Lacceroic (C32) Psyllic (C33) Geddic (C34) Ceroplastic (C35) Hexatriacontylic (C36) Heptatriacontanoic (C37) Octatriacontanoic (C38) Nantriacontanoic (C39)Tetracontanoic (C40) Unsaturated Faitty acids found in muscles are namely Octanoic (8:1)Decenoic (10:1)Decadienoic (10:2) Lauroleic (12:1)Laurolinoleic (12.2) Myristovaccenic (14:1) Myristolinoleic (14:2) Myristolinolenic (14:3) Palmitolinolenic (16:3) Palmitidonic (16:4) Isinolenic (18:3) Stearidonic (18:4) Dihomo-a-linolenic (20:3) Eicosatetraenoic (20:4) Eicosapentaenoic (20:5) Clupanodonic (22:5) Doeosahexaenoic (22:6) 9,12,15,18,21-Tetrapentanoic (24.5) 6,9,12,15,18,21-Tetracosahexaenoic (24:6)

are found in the muslces of diverse animal species. (https://www.researchgate.net/ publication).

Objective:

The objectives of this research are to:

1. Evaluation Meat quality of animal species: This study will undertake animal species like fish, domestic fowl, goat, sheep, buffalo, pig etc.
2. To study parameters like: pH, amount of lactic acid, volatile fatty acids, bounded water, solubility of proteins colour and tenderness.
3. To aware about meat: amount of daily meat intake, find good source of meat, benefit of meat, harmful effect of meat, awareness about good fat and bad fat from meat source.
4. To study risk factors: Over age 45 for men and 50-55 for women, High cholesterol on a prior test, Previous cardiovascular problem, Smoking cigarettes, Being overweight or obese, Eating an unhealthy diet, Not getting enough physical activity. Having high blood pressure (hypertension)

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Introduction:

Meat is valued as complete protein food containing all the amino acids necessary for the human body. The fat of meat which varies widely with the species quality, and cut is a valuable source of energy and also influences the flavor juiciness, and tenderness of the lean, Parts such as Livers, Kindneys, hearts, and other portions are excellent sources of vitamins and of essential minerals, easily assimilated by the human system.

Meat the flesh or other edible parts of animals usually domesticated cattle, swine, sheep, chicken and many more used for food, including not only the muscles and fat but also the tendons and ligaments. Meat digests somewhat slowly, but 95 perent of meat protein and 96 percent of the fat are digested. Fats tend to retard the digestion of other foods; thus, meat with a reasonable proportion of fat remains longer in the stomach, delaying bunger and giving “staying power.” Extractives in meat cause a flow of saliva and gastric juices, creating the desire to eat and ensuring ease of digestion.

Fish skin contains more lipid than the muscle tissue. Fish store large amounts of lipids, usually in the liver. The fatty acids have high digestibilities and energy value in all animal. The liver of these type of fish are more susceptible to lipid accumulation as compared to their muscle.

The most widely consumed meat is beef, the flesh of mature cattle that normally weigh from 450 to 540 kg (1000 to 1200) pounds) and yield between 55 and 60 percent of their weight in meat. Veal the fish of calves of cattle, is much less fatty than beef.

The pig is the world's second largest provider of meat. When taken to slaughter, pigs generally weigh between 90 and 135 kg (200 and 300 pounds) and provide about 70 to 74 percent of that weight in meat.

Meat from goat and sheep is produced on a much smaller scale than either beef or pork (less than one-tenth of the provided by cattle, for example). They ordinarily weigh between 45 and 70kg (100 and 150 pounds), although the most select lambs may weigh no more than 14 to 18 kg (30 to 40 pounds) and yield about 48 to 50 percent of their weight in meat.

Nutritional quality is determined by the value of the product for the consumers physical health, growth, development, reproduction, and general well-being. Nutritional quality criteria on meat have traditionally revolved around lipid content and composition and essential amino acid profile in raw meat. Over the past few years, researchers have turned to look at the effects of meat structure and technological processes on the bioavailability of high nutritional value muscle proteins. The potential impacts of metabolic and contractile muscle type on nutritional qualities need to be investigated. Indeed, given the compositional differences between muscle fiber types, the nutritional qualities of meat can be expected to vary according to their proportions in the source muscle. Iron is an essential micronutrient, and heme iron, which is found mainly-inmucles is one of

5. Dietary Suggestion. Buy lean cuts of meal cut away all visible fat before cooking it, Remove the skin from chicken before cooking it, Don't eat fried foods or high-fat sauces, Instead of frying meat, broil it or grill it.
6. To varying fatty acid compositions in muscle and tissue have profound effects on muscle quality.
7. Fatty acid composition determines the firmness/oiliness of tissue and the oxidative stability of muscle, thus diverse animals will particularly

i) The total lipid content in fishes tend to be the lowest, since the lipids will extracted from fishes muscles.

ii) The pig being a monogastric species, is amenable to changes in the fatty acid composition.

iii) Sheep and goat are reared on grass diets and slaughtered at the same body weight thus less lipid in muscle.

iv) The fatty acid composition in the beef distributed significantly like beef kidney, beef and pork liver, and beef heart fatty acids contained 25-36% of polyunsaturated fatty acid.

Hypothesis:

Proper quantification of fatty acids present meat and identifying and emphasizing specific beneficial fatty acids. Understanding the scientific approach for fatty acid analysis is integral to the development of new products and market application of meat.

Methodology:

Samples from meat of different animals will collected and processed to analysation. Fatty acids are commonly analyzed by gas chromatography (GC) after conversion to fatty acid methyl esters (FAMEs) which are more easily separated and quantified than eighter triglycerides or fee fatty acids. In most methods the fat is sapoaified, which liberates the fatty acids from triglycerides, phospholipids, etc-producing free acids. The free acids are trains esterified to form fatty acid methyl esters. Matrices that are not pure fats and oils require an extraction step to liberate the fat for analysis.

Gas chromatography (GC) is a well-established technique used to identify and quantify the incorporation of fatty acids. It is also suitable for analyzing the

types and quantities of fats in foods. Analysis of fatty acids can provide valuable insights into lipid metabolism in health and disease.

In chromatographic separation, lipids are typically extracted from the sample using the solubility of lipids in solvent mixtures of chloroform and methanol. Sodium chloride is added to facilitate the separation of the mixture into aqueous and organic lipid containing phases. (Folch et. al. 1957 and Burdge et. al. 2000).

Complex lipid classes of interest can be separated from the total lipid extract by solid phase extraction (SPE). This separation technique elutes lipid classes based upon their polarity or binding affinity. Triacyglycerols (TAG) and cholesteryl esters (CE) are eluted first as a combined fraction, further classes, phosphatidylcholine (PC), Phosphatidylethanolamine (PE), and non-esterified fatty acid (NEFA) are eluted by increasing the polarity of the eluting solvent. The separation of TAG from CE exploits the binding of TAG only to a fresh SPE cartridge, allowing CE to be eluted. TAG can then be eluted by increasing the polarity of the eluting solvent (Folch et.al. 1957 and Burdge et.al. 2000).

This method allows multiple samples to be separated simultaneously with a higher yield than is achieved with thin layer chromatography, which means that relatively small sized samples (e.g. < 100□l plasma or serum, < 100 mg tissue) can be analyzed (Seppanen-Laakso et.al. 2002 and Beesley et.al. 2000).

Importance of Study:

International Status:

Meat fatty acid composition is influenced by genetic factors, although to a lower extent than dietary factors. The species is the major source of variation in fatty acid composition with ruminant meats being more saturated as a result of biohydrogenation in the remen compared to the meat of monogastric animals. The level of fatness also has an effect on the meat fatty acid composition. (Stefaan De

Smet et.al. 2004). Pigs have high levels of polyunsaturated fatty acids (PUFA), including the long chain (C20-22) PUFA in adipose tissue and muscle. The full range of PUFA are also found in sheep adipose tissue and muscle whereas cattle 'conserve' long chain PUFA in muscle phospholipid Linoleie acid (18:2n-6) is a major ingredient of feeds for all species (Wood et.al. 2008)

Susana P. Alves and her team in 2015 studied that Muskoxen Longissimusdorsi, the lipid content of muscle, adipose tissue and liver averaged284, 846 and 173 mg/g of dry tissue, respectively. This large lipid contents confirms that in late winter, when forage availability is scare muskoxen from West Greenland still have high fat reserves, demonstrating that they are well adapted to seasonal feed restriction. A detailed characterization of FA and dimethylacetal composition of muskoxen muscle, subcutaneous adipose tissue and liver showed there arelittle differences on FA and composition between sexes.

The reproducibility (R) values of the majority of Fas were less than 3% of their absolute values. Differences in calculating ionization detector response factors and / or autoxidation caused by faulty sample-handling could lead to variation in quantification of Fas in fish was studied by D. Trbovic et.al. in 2016.

National Status:

Dugan (1987) studied Meat fat of different animal and its by products and their utilization. Sharma et.al. (2013) studied the different fats and its Processing and Its quality Control. Analysis of goat milk samples revealed the highest concentration saturated fatty acids (SFA) out of total milk.

Expected Outcome:

With the aim to reinforce laboratory competence in the field of testing the quality of meat from different cattle, a study on the precision of fatty acid (FA) analyses in meat and meat feed will undertake.

The proposed synopsis provides a fast and efficient means of identifying fats and its feed for quality control purposes of health of society. The reproducibility values of the majority of Fas analyzed in this study will compare to values recommended by the ISO standard method as a maximum allowable difference. Therefore, adequate accuracy will try to obtained in this study for quantification of most of the FAs.

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Regional Status:

YogitaKarandikar and her team in 2016 studied the lipids comprise a group of polar and non-polar compounds, including triglycerides (TGs), diglycerides, mono-glycerides, fatty acids, phospholipids, and sterols. In the diet, lipids contribute to the taste, texture, and energy content of a food. In the body, lipids have many roles including a source of readily available and stored energy, a structural and functional component of all cell memberanes, and precursors for elcosanoids and cell signaling molecules, in addition to helping with the absorption of fat-soluble vitamins and other food components.

The traditional texts designate Cow Ghee as MedhyaRasayanna, beneficial for mental alertness and memory. There has been concern about increased risk of cardiovascular disease due to its high percentage of saturated fatty acids in ghee. Amongst all edible fats, nutrition composition of cow ghee and butter is comparatively similar. Hence we had planned a study to assess effect of cow ghee on memory and lipid profile.

Scope of Study:

Fatty acids (FA) play important role in human diet and health. FA add flavor and taste to meat. Fatty acid composition of meat is a complex polygenic trait that is controlled by genetics and environmental factors. Therefore, the scope of the present study is could help to devise effective breeding plans and to identify strategies for the improvement of meat FA profile and selection of meat to diet.

Work Plan:

To determine and analyse the liquid profile of different types of meat

First year:

1. Sample Preparation: Collection of meat samples from local slaughters and fish market to determine the contents of total lipids and FA composition.
2. Fatty Acid Analysis by Gas Chromatography
3. Quality Control: Reliability and accuracy of the analytical method for the detection of the FAs will ensure by the use of certified reference material.

Second year:

4. Statistical Analysis: Precision for the comparative study was derived from statistical analysis
5. Suggestion to all respective sources of meat to a particular source and cut bad meat source.

Third year

6. Publication of data, writing and submitting of the thesis.

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